

VF Series High-Pressure, High-Temperature Butterfly Valve Assemblies

VF Series High-Pressure, High-Temperature Butterfly Valve Assemblies are specifically designed for a wide range of Heating, Ventilating, and Air Conditioning (HVAC) applications including two-position and modulating/throttling control of hot water, chilled water, condenser water, and steam. Refer to the VF Series High-Pressure, High-Temperature Butterfly Valves for Steam Service Application Note (LIT-977321) for more information on steam applications. These lug-style valves offer bidirectional shutoff at fully rated American National Standards Institute (ANSI) Class 150 and 300 operating pressures, increasing the range of applications – particularly in high-rise building HVAC control applications. ANSI Class 150 and 300 models are also suitable for steam applications.

ANSI Class 150 Butterfly Valves are available in two-way configurations, in sizes ranging from 2-1/2 through 16 in. ANSI Class 300 Butterfly Valves are available in two-way configurations, in sizes ranging from 2-1/2 through 14 in. ANSI Class 150 valves are rated for 240 psig at 250°F, and ANSI Class 300 valves are rated for 550 psig at 250°F.



Figure 1: VF Series High-Pressure, High-Temperature Butterfly Valve Assemblies

Features and Benefits	
<input type="checkbox"/> Compatible with All Types of ANSI 150/300 Slip-On and Weld-Neck Flanges	Enables field configuration with readily available standard fittings
<input type="checkbox"/> High-Pressure, High-Temperature Design	Increases the range of applications, particularly in high-rise building HVAC control applications
<input type="checkbox"/> Bidirectional Shutoff, Dead-End Service	Provides positive closure in both directions to full ANSI pressure ratings
<input type="checkbox"/> Live-Loaded Seat Design with Fully Encased O-Ring	Offers superior sealing and long service life
<input type="checkbox"/> Double Offset Stem Design	Reduces seat wear to significantly extend cycle life
<input type="checkbox"/> Broad Range of Compact Pre-Assembled Actuators Available	Provides a wide selection for new and replacement electric and pneumatic actuators
<input type="checkbox"/> Direct Actuator-to-Stem Mounting	Reduces hysteresis and simplifies installation

Table 1: Ordering Data

V		F		Butterfly Valve										
1	2													
C			Body Type											
3			C = Two-Way, Normally Closed (N.C.) M = Manually Operated N = Two-Way, Normally Open (N.O.)											
-				1	0	0	Valve Size							
4				5	6	7	025 = 2-1/2 in. 030 = 3 in. 040 = 4 in. 050 = 5 in. 060 = 6 in. 080 = 8 in. 100 = 10 in. 120 = 12 in. 140 = 14 in. 160 = 16 in.							
V								Flange						
8								V = ANSI Class 150 Z = ANSI Class 300						
E									Stem					
9									E = 17-4 PH Stainless Steel					
-										7	0	7	Material	
10										11	12	13	Actuator	
10										11	12	13	See Table 2.	
N														Accessories
14														B = High Pressure Positioner C = 120 VAC Solenoid with Speed Controls D = Thermostat/Heater Kit for On/Off Electric Actuators E = 24 VAC Solenoid with Speed Controls G = Gear-Operated Manual Hand Wheel M = Ten-Position Manual Handle N = Thermostat/Heater Kit for Proportional Electric Actuators
1	2	3	4	5	6	7	8	9	10	11	12	13	14	= Field
V	F	C	-	1	0	0	V	E	-	7	0	7	N	
<i>Butterfly Valve Assembly</i>														

Example: Two-way normally closed valve, 10 in., ANSI Class 150 with 17-4 PH stainless steel stem, proportional non-spring return electric actuator, and thermostat/heater kit.

Table 2: Ordering Data – Adding a Factory-Mounted Industrial-Grade Pneumatic or Electric Actuator

Note: See Table 3, Table 4, Table 5, and Table 6 for valid factory assemblies.

Electric, Proportional, Non-Spring Return	High Pressure Pneumatic, Spring Return
702 = VA-9072-01	340 = V-9193-14
703 = VA-9073-01	360 = V-9193-16
704 = VA-9074-01	
705 = VA-9075-01	422 = V-9194-22
706 = VA-9076-01	430 = V-9194-13
707 = VA-9077-01	432 = V-9194-23
702N4 = VA-9072-11	
705N4 = VA-9075-11	440 = V-9194-14
707N4 = VA-9077-11	442 = V-9194-24
907 = VA-9087-01	452 = V-9194-25
908 = VA-9088-01	
Electric, On/Off, Non-Spring Return	462 = V-9194-26
722 = VA-9072-02	530 = V-9195-13
723 = VA-9073-02	550 = V-9195-15
724 = VA-9074-02	
725 = VA-9075-02	
726 = VA-9076-02	630 = V-9196-13
727 = VA-9077-02	650 = V-9196-15
722N4 = VA-9072-12	660 = V-9196-16
725N4 = VA-9075-12	
727N4 = VA-9077-12	730 = V-9197-13
	750 = V-9197-15
927 = VA-9087-02	
928 = VA-9088-02	
High Pressure Pneumatic, Non-Spring Return	
030 = V-9093-1	820 = V-9198-12
040 = V-9094-1	830 = V-9198-13
042 = V-9094-2	840 = V-9198-14
050 = V-9095-1	850 = V-9198-15
060 = V-9096-1	
070 = V-9097-1	
080 = V-9098-1	



Figure 2: Two-Way Valve with Industrial-Grade, Non-Spring Return, VA-90xx Series Electric Actuator

Table 3: Two-Way Valves with Industrial-Grade, Non-Spring Return, VA-90xx Series Electric Actuators

Actuator				AC 120 V Powered Actuator		AC 24 V Powered Actuator	
Size, in.	Cv at 90 Degrees	Cv at 70 Degrees	Closeoff Pressure	On/Off	0 to 10 VDC Proportional	On/Off	0 to 10 VDC Proportional
Two-Way, Normally Closed – ANSI Class 300 Flanges¹							
2-1/2	160	100	550 psig	VFC-025ZE-723D	VFC-025ZE-703N	VFC-025ZE-725D4	VFC-025ZE-705N4
3	185	155		VFC-030ZE-723D	VFC-030ZE-703N	VFC-030ZE-725D4	VFC-030ZE-705N4
4	375	315		VFC-040ZE-723D	VFC-040ZE-703N	VFC-040ZE-725D4	VFC-040ZE-705N4
5	790	500		VFC-050ZE-725D	VFC-050ZE-705N	VFC-050ZE-725D4	VFC-050ZE-705N4
6	1,000	710		VFC-060ZE-726D	VFC-060ZE-706N	VFC-060ZE-727D4	VFC-060ZE-707N4
8	2,000	1,360		VFC-080ZE-727D	VFC-080ZE-707N	VFC-080ZE-727D4	VFC-080ZE-707N4
10	2,650	1,740		VFC-100ZE-927D	VFC-100ZE-907N	—	—
12	4,000	2,500		VFC-120ZE-928D	VFC-120ZE-908N	—	—
14	4,100	2,600		VFC-140ZE-928D	VFC-140ZE-908N	—	—
Two-Way, Normally Closed – ANSI Class 150 Flanges²							
2-1/2	160	100	240 psig	VFC-025VE-722D	VFC-025VE-702N	VFC-025VE-722D4	VFC-025VE-702N4
3	185	155		VFC-030VE-722D	VFC-030VE-702N	VFC-030VE-722D4	VFC-030VE-702N4
4	375	315		VFC-040VE-722D	VFC-040VE-702N	VFC-040VE-722D4	VFC-040VE-702N4
5	790	500		VFC-050VE-724D	VFC-050VE-704N	VFC-050VE-725D4	VFC-050VE-705N4
6	1,350	750		VFC-060VE-725D	VFC-060VE-705N	VFC-060VE-725D4	VFC-060VE-705N4
8	2,800	1,590		VFC-080VE-726D	VFC-080VE-706N	VFC-080VE-727D4	VFC-080VE-707N4
10	4,300	2,430		VFC-100VE-727D	VFC-100VE-707N	VFC-100VE-727D4	VFC-100VE-707N4
12	6,650	3,750		VFC-120VE-728D	VFC-120VE-708N	—	—
14	7,650	4,300		VFC-140VE-927D	VFC-140VE-907N	—	—
16	9,800	5,510		VFC-160VE-928D	VFC-160VE-908N	—	—

1. Maximum closeoff pressure for ANSI Class 300 valves is 740 psig (5102.1 kPa) for fluid temperatures below 100°F (37.8°C), and 550 psig (3,790 kPa) for fluid temperatures at 250°F (121.1°C). Maximum steam pressure is 150 psig (1034.2 kPa) for On/Off service, and 50 psig (344.8 kPa) for proportional service.

2. Maximum closeoff pressure for ANSI Class 150 valves is 285 psig (1965 kPa) for fluid temperatures below 100°F (37.8°C), and 240 psig (1654.8 kPa) for fluid temperatures at 250°F (121.1°C). Maximum steam pressure is 150 psig (1034.2 kPa) for On/Off service, and 50 psig (344.8 kPa) for proportional service.



**Figure 3: Two-Way Valve with Industrial-Grade,
Spring Return, V-919x Series High Pressure Pneumatic Actuator**

**Table 4: Two-Way Valves with Industrial-Grade, Spring Return,
V-919x Series High Pressure Pneumatic Actuators**

Actuator				On/Off ¹		Proportional (with Positioner)	
Size, in.	Cv at 90 Degrees	Cv at 70 Degrees	Closeoff Pressure	Spring Closed	Spring Open	Spring Closed	Spring Open
Two-Way, Normally Closed – ANSI Class 300 Flanges²							
2-1/2	160	100	550 psig	VFC-024ZE-432C	VFN-025ZE-422C	VFC-025ZE-432B	VFN-025ZE-422B
3	185	155		VFC-030ZE-442C	VFN-030ZE-422C	VFC-030ZE-442B	VFN-030ZE-422B
4	375	315		VFC-040ZE-452C	VFN-040ZE-432C	VFC-040ZE-452B	VFN-040ZE-432B
5	790	500		VFC-050ZE-650C	VFN-050ZE-630C	VFC-050ZE-650B	VFN-050ZE-630B
6	1,000	710		VFC-060ZE-660C	VFN-060ZE-630C	VFC-060ZE-660B	VFN-060ZE-630B
8	2,000	1,360		VFC-080ZE-750C	VFN-080ZE-730C	VFC-080ZE-750B	VFN-080ZE-730B
10	2,650	1,740		VFC-100ZE-840C	VFN-100ZE-830C	VFC-100ZE-840B	VFN-100ZE-830B
12	4,000	2,500		VFC-120ZE-850C	VFN-120ZE-840C	VFC-120ZE-850B	VFN-120ZE-840B
Two-Way, Normally Closed – ANSI Class 150 Flanges³							
2-1/2	160	100	240 psig	VFC-025VE-360C	VFN-025VE-340C	VFC-025VE-360B	VFN-025VE-340B
3	185	155		VFC-030VE-360C	VFN-030VE-340C	VFC-030VE-360B	VFN-030VE-340B
4	375	315		VFC-040VE-430C	VFN-040VE-440C	VFC-040VE-430B	VFN-040VE-440B
5	790	500		VFC-050VE-462C	VFN-050VE-530C	VFC-050VE-462B	VFN-050VE-530B
6	1,350	750		VFC-060VE-550C	VFN-060VE-530C	VFC-060VE-550B	VFN-060VE-530B
8	2,800	1,590		VFC-080VE-650C	VFN-080VE-630C	VFC-080VE-650B	VFN-080VE-630B
10	4,300	2,430		VFC-100VE-750C	VFN-100VE-730C	VFC-100VE-750B	VFN-100VE-730B
12	6,650	3,750		VFC-120VE-830C	VFN-120VE-820C	VFC-120VE-830B	VFN-120VE-820B
14	7,650	4,300	VFC-140VE-850C	VFN-140VE-830C	VFC-140VE-850B	VFN-140VE-830B	

1. On/Off assemblies come with 120 VAC solenoid valve and speed controls. If a 24 VAC solenoid is desired, change the **C** at the end of the code number to an **E**.
2. Maximum closeoff pressure for ANSI Class 300 valves is 740 psig (5102.1 kPa) for fluid temperatures below 100°F (37.8°C), and 550 psig (3,790 kPa) for fluid temperatures at 250°F (121.1°C). Maximum steam pressure is 150 psig (1034.2 kPa) for On/Off service, and 50 psig (344.8 kPa) for proportional service.
3. Maximum closeoff pressure for ANSI Class 150 valves is 285 psig (1965 kPa) for fluid temperatures below 100°F (37.8°C), and 240 psig (1654.8 kPa) for fluid temperatures at 250°F (121.1°C). Maximum steam pressure is 150 psig (1034.2 kPa) for On/Off service, and 50 psig (344.8 kPa) for proportional service.



Figure 4: Two-Way Valve with Industrial-Grade, Non-Spring Return, V-909x Series High Pressure Pneumatic Actuator

Table 5: Two-Way Valves with Industrial-Grade, Non-Spring Return, V-909x Series High Pressure Pneumatic Actuators

Actuator				On/Off ¹	Proportional (with Positioner)
Size, in.	Cv at 90 Degrees	Cv at 70 Degrees	Closeoff Pressure		
Two-Way, Normally Closed – ANSI Class 300 Flanges²					
2-1/2	160	100	550 psig	VFC-025ZE-030C	VFC-025ZE-030B
3	185	155		VFC-030ZE-030C	VFC-030ZE-030B
4	375	315		VFC-040ZE-040C	VFC-040ZE-040B
5	790	500		VFC-050ZE-042C	VFC-050ZE-042B
6	1,000	710		VFC-060ZE-050C	VFC-060ZE-050B
8	2,000	1,360		VFC-080ZE-060C	VFC-080ZE-060B
10	2,650	1,740		VFC-100ZE-070C	VFC-100ZE-070B
12	4,000	2,500		VFC-120ZE-070C	VFC-120ZE-070B
14	4,100	2,600		VFC-140ZE-080C	VFC-140ZE-080B
Two-Way, Normally Closed – ANSI Class 150 Flanges³					
2-1/2	160	100	240 psig	VFC-025VE-030C	VFC-025VE-030B
3	185	155		VFC-030VE-030C	VFC-030VE-030B
4	375	315		VFC-040VE-030C	VFC-040VE-030B
5	790	500		VFC-050VE-042C	VFC-050VE-042B
6	1,350	750		VFC-060VE-042C	VFC-060VE-042B
8	2,800	1,590		VFC-080VE-050C	VFC-080VE-050B
10	4,300	2,430		VFC-100VE-060C	VFC-100VE-060B
12	6,650	3,750		VFC-120VE-070C	VFC-120VE-070B
14	7,650	4,300		VFC-140VE-070C	VFC-140VE-070B
16	9,800	5,510		VFC-160VE-080C	VFC-160VE-080B

1. On/Off assemblies come with 120 VAC solenoid valve and speed controls. If a 24 VAC solenoid is desired, change the **C** at the end of the code number to an **E**.
2. Maximum closeoff pressure for ANSI Class 300 valves is 740 psig (5102.1 kPa) for fluid temperatures below 100°F (37.8°C), and 550 psig (3,790 kPa) for fluid temperatures at 250°F (121.1°C). Maximum steam pressure is 150 psig (1034.2 kPa) for On/Off service, and 50 psig (344.8 kPa) for proportional service.
3. Maximum closeoff pressure for ANSI Class 150 valves is 285 psig (1965 kPa) for fluid temperatures below 100°F (37.8°C), and 240 psig (1654.8 kPa) for fluid temperatures at 250°F (121.1°C). Maximum steam pressure is 150 psig (1034.2 kPa) for On/Off service, and 50 psig (344.8 kPa) for proportional service.



Figure 5: Two-Way Valve with Manual Operator

Table 6: Two-Way Valves with Manual Operators

Actuator		Closeoff Pressure	Ten-Position Manual Handle	Gear-Operated Manual Hand Wheel
Size, in.	Cv at 90 Degrees			
Two-Way, Manually Operated – ANSI Class 300 Flanges¹				
2-1/2	160	550 psig	VFM-025ZE-000M	VFM-025ZE-000G
3	185		VFM-030ZE-000M	VFM-030ZE-000G
4	375		VFM-040ZE-000M	VFM-040ZE-000G
5	790		VFM-050ZE-000M	VFM-050ZE-000G
6	1,000		VFM-060ZE-000M	VFM-060ZE-000G
8	2,000		---	VFM-080ZE-000G
10	2,650		---	VFM-100ZE-000G
12	4,000		---	VFM-120ZE-000G
14	4,100		---	VFM-140ZE-000G
Two-Way, Manually Operated – ANSI Class 150 Flanges²				
2-1/2	160	240 psig	VFM-025VE-000M	VFM-025VE-000G
3	185		VFM-030VE-000M	VFM-030VE-000G
4	375		VFM-040VE-000M	VFM-040VE-000G
5	790		VFM-050VE-000M	VFM-050VE-000G
6	1,350		VFM-060VE-000M	VFM-060VE-000G
8	2,800		---	VFM-080VE-000G
10	4,300		---	VFM-100VE-000G
12	6,650		---	VFM-120VE-000G
14	7,650		---	VFM-140VE-000G

1. Maximum closeoff pressure for ANSI Class 300 valves is 740 psig (5102.1 kPa) for fluid temperatures below 100°F (37.8°C), and 550 psig (3,790 kPa) for fluid temperatures at 250°F (121.1°C). Maximum steam pressure is 150 psig (1034.2 kPa) for On/Off service, and 50 psig (344.8 kPa) for proportional service.
2. Maximum closeoff pressure for ANSI Class 150 valves is 285 psig (1965 kPa) for fluid temperatures below 100°F (37.8°C), and 240 psig (1654.8 kPa) for fluid temperatures at 250°F (121.1°C). Maximum steam pressure is 150 psig (1034.2 kPa) for On/Off service, and 50 psig (344.8 kPa) for proportional service.

Application Overview

VF Series High-Pressure, High-Temperature Butterfly Valves provide the highest quality and best value available in the HVAC control industry. These valves are recognized as a proven leader, with more than 25 years of successful service in process industries worldwide. Their unique, patented design has received *Chemical Processing's Valor Award for Best Product*. The simple, innovative design of these valves provides rugged reliability and extremely easy maintenance in the field. Independent and internal tests have proven their superior service life capability, with bubble-tight shutoff through over 100,000 cycles.

VF Series High-Pressure, High-Temperature Butterfly Valves can be automated inexpensively with pneumatic and electric actuators.

When compared to gate, globe, ball, and plug valves, VF Series High-Pressure, High-Temperature Butterfly Valves are significantly smaller and lighter in weight; therefore, installation time and maintenance costs are greatly reduced.

All VF Series High-Pressure, High-Temperature Butterfly Valves are available with a factory-assembled and calibrated actuator, sized with a 25% safety factor to provide years of trouble-free operation. The wide variety of actuator choices include high-pressure pneumatic rack and pinion-style actuators (both spring return and non-spring return), and high-torque rotary electric actuators which are fully compatible with Metasys® controllers. The valve and actuator can be provided in Normally Open (N.O.) or Normally Closed (N.C.) combinations for pneumatic two-way operation.

Valve Body

The ANSI Class 150 lug-style valve body is carbon steel, and meets the pressure and temperature requirements for ANSI B16.5, Class 150 pipe flanges. The ANSI Class 300 lug-style valve body is carbon steel, and meets the pressure and temperature requirements for ANSI B16.5, Class 300 pipe flanges.

Extended Neck

The extended neck allows for 2 in. (51 mm) of pipeline insulation, as well as easy access for stem packing adjustments and actuator mounting.

Stem

The one-piece stem is constructed of high strength 17-4 PH stainless steel. The output shaft of the stem is extended to provide a direct connection of the actuator to the valve.

Disc

The disc is constructed of 316 stainless steel, and is engineered to maximize flow. The double offset design of the stem reduces seat wear to significantly extend cycle life. Bidirectional bubble-tight shutoff is assured throughout the full pressure range.

Taper Pins

The taper pins are precision fit into drilled, taper-reamed holes, providing a positive connection and maximum strength between the valve disc and stem.

Internal Travel Stop

An internal travel stop is designed to prevent overtravel of the disc, minimizing possible seat damage.

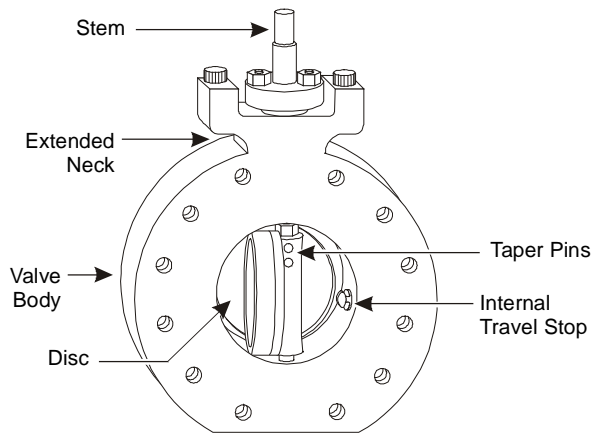


Figure 6: VF Series High-Pressure, High-Temperature Butterfly Valve

Adjustable Stem Packing

The stem packing system features easy access to adjusting hex-head nuts without requiring removal of the actuator. The stem consists of a gland ring, a gland retainer, studs, hex-head nuts, and lock washers. A slight 1/4 turn of the hex-head nuts is usually all that is required should field adjustment ever be needed. Both hex-head nuts must be evenly adjusted, and not over tightened.

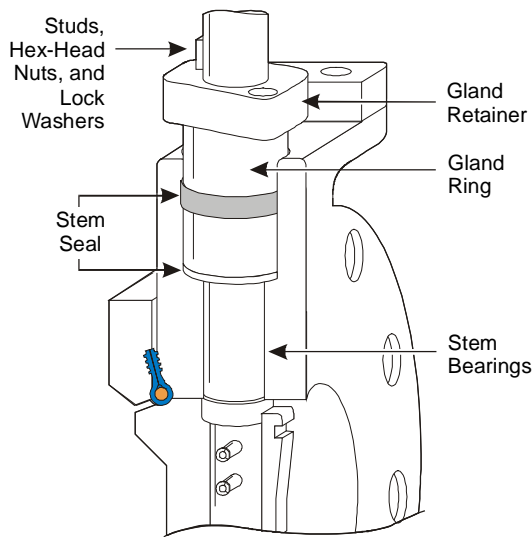


Figure 7: Adjustable Stem Packing System

Stem Seal

A positive seal is formed around the stem by the constant compression and excellent corrosion resistance of the stem seal. PTFE packing rings seal the stem, and a carbon fiber anti-extrusion ring retains the packing.

All ANSI Class 150 and 2-1/2 through 12 in. ANSI Class 300 valves feature one set of stem seal packing rings and a stem locating plug with an O-ring seal in the body base. The 14 in. ANSI Class 300 valves feature upper and base twin stem seals that balance axial forces on the stem and disc under all operating conditions.

Stem Bearings

Top and bottom bearings, consisting of a 316 stainless steel shell with a TFE/glass fabric liner bearing surface, securely support the stem. The stem bearings provide excellent resistance to corrosion and distortion from high temperatures and mechanical loading forces.

Seat Design

The unique, live-loaded seat consists of a resilient silicone O-ring energizer that is fully encased by the reinforced polytetrafluoroethylene (RPTFE) seat. The seat is locked into the valve body recess by a full-faced seat retainer plate. This simple, reliable, and proven combination provides many exclusive advantages including:

- The O-ring energizer is completely isolated from all contact with the line media by the RPTFE seat.
- Serrations in the seat retainer plate and body recess secure the seat in place. The full-faced retainer plate is bolted to the body, locking the seat in the correct position. The seat is secured even without the mating flange.
- The closely confined and well supported seat is energized by the disc and line pressure. The higher the pressure, the tighter the seal. In low pressure applications, the energized seat offers superior sealing and longer service life than many other designs.
- Line media is sealed bubble-tight in both directions.
- The live-loaded seat is self adjusting for wear and temperature fluctuations.
- Seat replacement is extremely easy – just remove the seat retainer plate, rotate the disc into the closed position, and place a new seat in the machined recess of the body. Performing this procedure does not disturb the disc or stem.

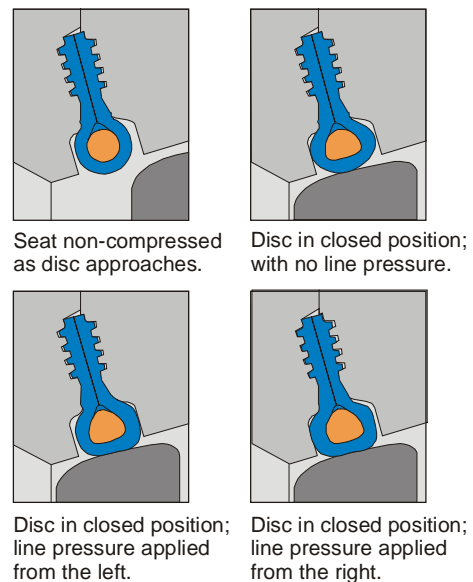


Figure 8: Exclusive High Performance Seat

Double Offset Stem and Disc Design

The double offset design of VF Series High-Pressure, High-Temperature Butterfly Valves ensures reduced seat wear and bidirectional bubble-tight shutoff throughout the full pressure range.

At the point of initial disc opening, the offset disc produces a cam-like action that rotates the disc away from the seat with minimum drag. This cam-like action reduces seat wear and eliminates seat deformation when the disc is in the open position. When the disc rotates beyond the point of initial opening, the disc does not make contact with the seat. This superior design extends the seat service life and reduces the valve operating torque. As the valve closes, the cam-like action converts the rotary motion to effectively push the disc onto the seat. The wiping action of the disc against the seat prevents undesirable material buildup from suspended solids.

The taper pins carry essentially equal loads while anchoring the disc to the stem. This arrangement permits accurate disc closure for consistent sealing and positive shutoff.

For more than 25 years, the reliability of these butterfly valves has been conclusively proven, both in lab tests as well as thousands of field applications. In one test of over 100,000 cycles at 720 psig (4,961 kPa) of pressure, the seat remained in excellent condition and continued to provide a bidirectional bubble-tight seal. In another test of more than 878,000 cycles at 2 psig (14 kPa) of pressure, the ANSI Class 150 valve continued to seal bubble-tight in both directions.

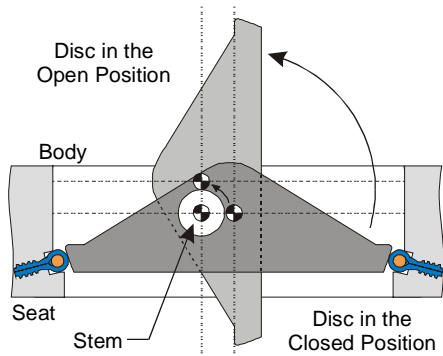


Figure 9: Double Offset Stem and Disc

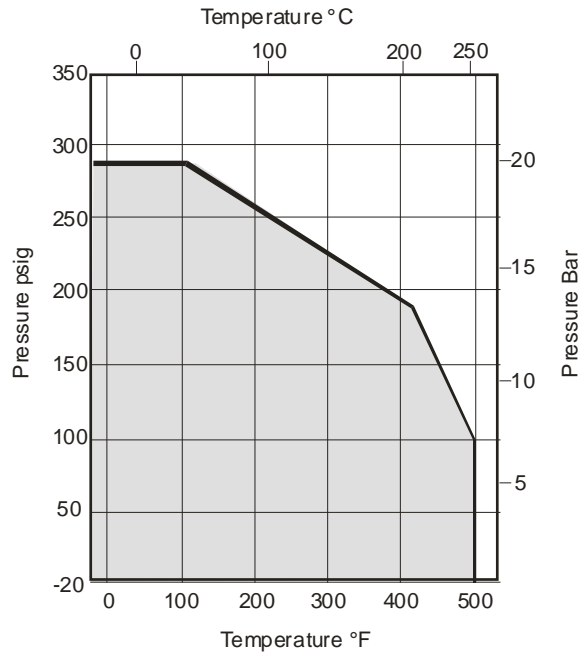


Figure 10: ANSI Class 150 VF Series High-Pressure, High-Temperature Butterfly Valves Pressure/Temperature Ratings

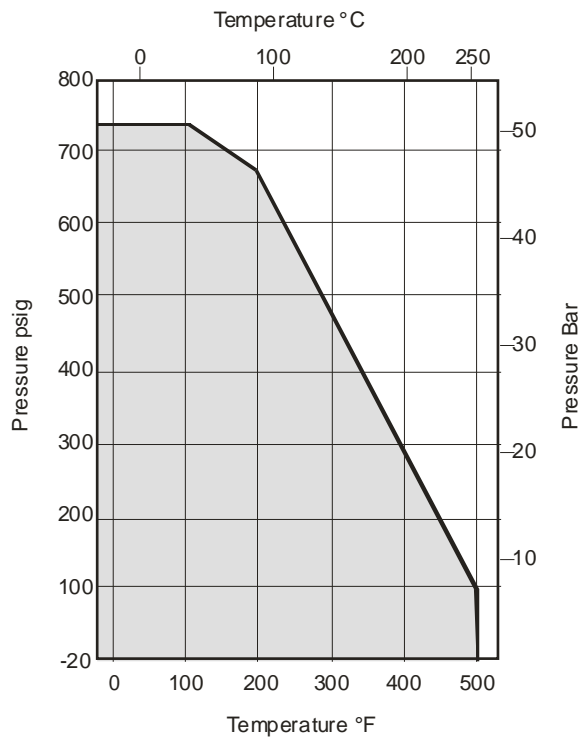


Figure 11: ANSI Class 300 VF Series High-Pressure, High-Temperature Butterfly Valves Pressure/Temperature Ratings

Table 7: Rangeability Values for 90° Rotation¹

Valve Size, in.	90° Disc Rotation	
	ANSI Class 150 Valves	ANSI Class 300 Valves
2-1/2	30:1	30:1
3	30:1	30:1
4	30:1	30:1
5	39:1	39:1
6	39:1	39:1
8	43:1	43:1
10	43:1	43:1
12	43:1	43:1
14	43:1	43:1
16	43:1	---

1. For steam throttling service applications, refer to the *VF Series High-Pressure, High-Temperature Butterfly Valves for Steam Service Application Note (LIT-977321)*.

Valve Actuators

All VF Series High-Pressure, High-Temperature Butterfly Valves are available with a wide range of factory-installed pneumatic and electric actuators. Table 8 and Table 9 list the actuator choices available for each ANSI Class valve type. All valve and actuator combinations have been sized with torque safety factors to provide adequate actuator torque for years of trouble-free operation.

Optional Actuator Accessories

All V-909x and V-919x Series High Pressure Pneumatic Rack and Pinion Actuators are furnished with factory installed 120 VAC solenoid valves for two-position operation. When these actuators are used for proportional service, the solenoid valve is replaced with a high pressure positioner. In two-position applications, factory-installed speed controls are available as a selectable option.

For more details on additional actuator accessories, refer to the appropriate actuator product bulletin.

Table 8: Representative Maximum Shipping Weights for VF Series High-Pressure, High-Temperature ANSI Class 150 Butterfly Valve and Actuator Assemblies¹

Valve Size, in.	Representative Actuator (Actuator Sub-Code)	Shipping Weight, lb (kg)
2-1/2	V-9193-16 (360)	41 (18.6)
3	V-9193-16 (360)	45 (20.4)
4	V-9194-13 (430)	56 (25.4)
5	V-9195-13 (530)	80 (36.3)
6	V-9195-15 (550)	90 (40.9)
8	V-9196-15 (650)	165 (74.9)
10	V-9197-15 (750)	250 (113.5)
12	V-9198-13 (830)	389 (177.6)
14	V-9198-15 (850)	482 (218.8)
16	V-9098-1 (080)	571 (259.2)

1. The above shipping weights are approximate, and are based on the heaviest valve, actuator, and accessory combination available for each assembly size.

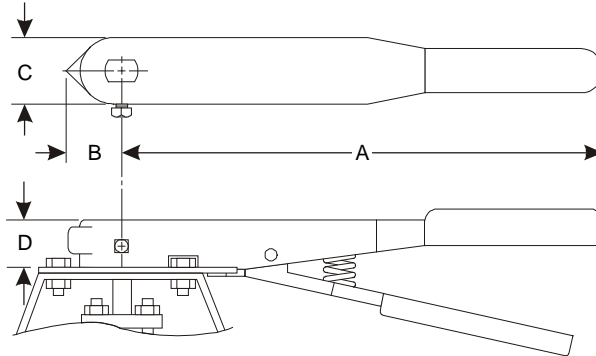
Table 9: Representative Maximum Shipping Weights for VF Series High-Pressure, High-Temperature ANSI Class 300 Butterfly Valve and Actuator Assemblies¹

Valve Size, in.	Representative Actuator (Actuator Sub-Code)	Shipping Weight, lb (kg)
2-1/2	VA-9073-01 (703)	58 (26.3)
3	VA-9073-01 (703)	68 (30.9)
4	VA-9073-01 (703)	75 (34.1)
5	V-9196-15 (650)	135 (61.3)
6	V-9196-16 (660)	155 (70.4)
8	V-9197-15 (750)	240 (109.0)
10	V-9198-14 (840)	386 (175.2)
12	V-9198-15 (850)	474 (215.2)
14	V-9098-1 (080)	621 (281.9)

1. The above shipping weights are approximate, and are based on the heaviest valve, actuator, and accessory combination available for each assembly size.

Optional Actuator Accessories

For manually operated actuator and valve assemblies, a ten-position manual handle or gear-operated manual hand wheel is available. See Table 10 and Table 11 for more details.

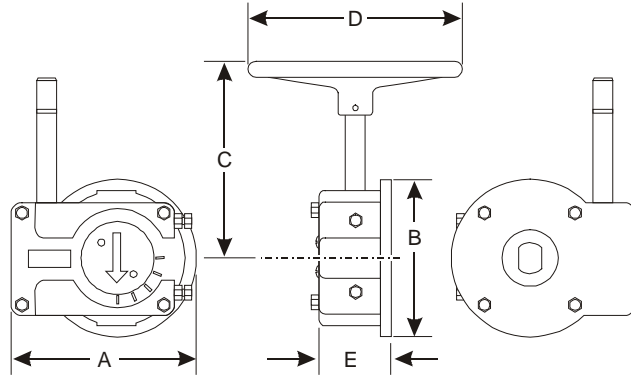


**Figure 12: Dimensions for Ten-Position Manual Handles
(See Table 10.)**

Table 10: Dimensions for Ten-Position Manual Handles, in. (mm)

Valve Size, in.		Ten-Position Manual Handle Kit ¹	A	B	C	D
ANSI Class 150 Valves	ANSI Class 300 Valves					
2-1/2 through 4	2-1/2 through 4	VF-999-401	10.62 (270)	1.12 (28)	1.38 (35)	1.0 (25)
5 and 6	5	VF-999-402	10.62 (270)	1.12 (28)	1.38 (35)	1.0 (25)

1. Kit includes a manual handle, notch plate, bracket, and mounting hardware.



**Figure 13: Dimensions for Gear-Operated Manual Hand Wheels
(See Table 11.)**

Table 11: Dimensions for Gear-Operated Manual Hand Wheels, in. (mm)

Valve Size, in.		Gear-Operated Manual Hand Wheel Kit ¹	A	B	C	D	E
ANSI Class 150 Valves	ANSI Class 300 Valves						
2-1/2 through 4	2-1/2 through 4	VF-999-501	6.89 (175)	5.91 (150)	7.50 (191)	8.0 (203)	2.50 (64)
5 and 6	5	VF-999-502	6.89 (175)	5.91 (150)	7.50 (191)	8.0 (203)	2.50 (64)
8	6	VF-999-503	6.89 (175)	5.91 (150)	7.50 (191)	8.0 (203)	2.50 (64)
10	8	VF-999-504	6.89 (175)	5.91 (150)	7.69 (195)	12.0 (305)	2.50 (64)
12	---	VF-999-505	6.89 (175)	5.91 (150)	7.69 (195)	12.0 (305)	2.50 (64)
14 and 16	---	VF-999-506	10.51 (267)	8.27 (210)	14.88 (378)	18.0 (457)	4.39 (112)
---	10	VF-999-507	10.51 (267)	8.27 (210)	14.81 (376)	12.0 (305)	4.39 (112)
---	12	VF-999-508	10.51 (267)	8.27 (210)	14.81 (376)	12.0 (305)	4.39 (112)
---	14	VF-999-509	10.51 (267)	8.27 (210)	14.88 (378)	18.0 (457)	4.39 (112)

1. Kit includes a manual hand wheel, bracket, adaptor (if required), and mounting hardware.

Product Guidelines

Please be sure to read the following information carefully before installing a VF Series High-Pressure, High-Temperature Butterfly Valve Assembly:

- The valve is designed to be mounted between ANSI flanges. When the valve is open, the disc extends into the pipe on both sides of the valve (further on the body side than the seat retainer side). Piping must be large enough to allow the disc to clear the pipe. In general, Class 150 valves clear the Schedule 40 pipe, and Class 300 valves clear the Schedule 80 pipe adequately.

If heavier piping is required, chamfering or recessing of the pipe inner diameter may be necessary. Contact the local Bray representative for more information.

- If the handle or actuator has been removed, do not rotate the disc beyond the fully open or closed position; doing so could cause damage to the sealing surfaces. VF Series High-Pressure, High-Temperature Butterfly Valves are equipped with stops to prevent overclosure. The valve is opened by turning counterclockwise and closed by turning clockwise. The machined flats at the top of the stem are parallel to the disc. For larger diameter valves that use a keyway, the disc follows the orientation of the key.

- For maximum service life, install the valve with the seat retainer upstream. Positive shutoff is obtained with the valve in either position; however, installation with the seat retainer upstream provides longer service life, especially in erosive services.
- With the disc in the closed position, carefully center the valve between the flanges. Tapped holes match ANSI pipe flanges and assist in positive alignment.
- The seat is sufficiently compressed by the seat retainer, and additional force from flange bolting is not required.
- Gaskets must conform to the requirements of API Standard 601, Edition 3 for ANSI B16.5 class flanges. Spiral wound gaskets are acceptable.

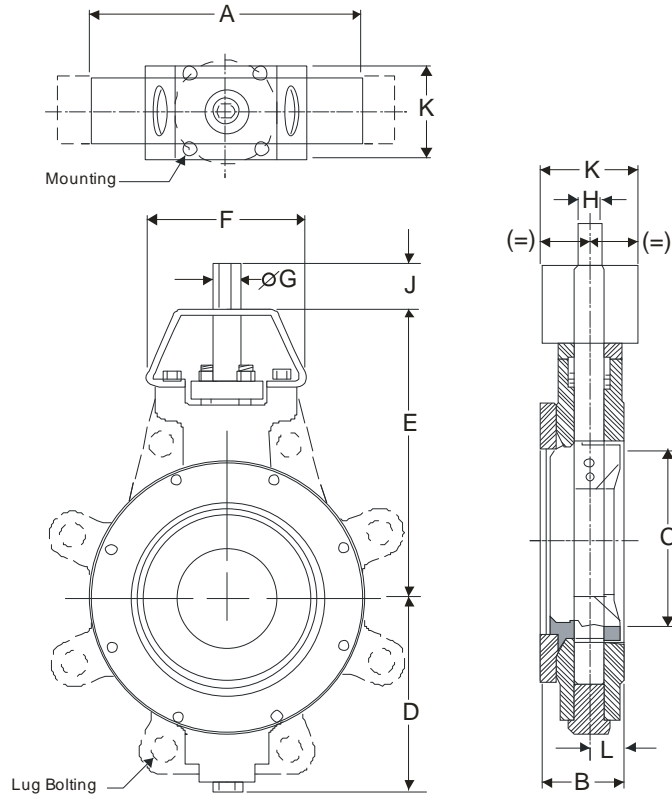


Figure 14: Two-Way VF Series High-Pressure, High-Temperature Butterfly Valve Dimensions (See Table 12 and Table 13.)

Table 12: ANSI Class 150 Two-Way Valve Dimensions, in.¹

Valve Size, in.	A	B	C	D	E	F	G	H	J	K	L	Lug Bolting Data			Net Valve Weight, lb ²
												BC, in.	No. of Holes	Threads UNC-2B	
2-1/2	4.75	1.88	2.28	3.81	6.38	4.36	0.63	0.43	1.25	2.50	0.77	5.50	4	5/8-11	14
3	5.25	1.88	2.86	4.09	6.63	4.36	0.63	0.43	1.25	2.50	0.77	6.00	4	5/8-11	15
4	6.75	2.03	3.72	4.71	7.50	4.36	0.63	0.43	1.25	2.50	0.75	7.50	8	5/8-11	23
5	7.50	2.23	4.80	5.07	7.50	5.12	0.75	0.51	1.25	4.50	0.94	8.50	8	3/4-10	34
6	8.62	2.23	5.88	5.57	8.00	5.12	0.75	0.51	1.25	4.50	0.94	9.50	8	3/4-10	47
8	10.75	2.40	7.80	6.94	9.50	5.12	0.87	0.63	1.25	4.50	0.94	11.75	8	3/4-10	54
10	13.06	2.75	9.78	8.56	10.75	6.12	1.18	0.87	2.00	4.50	1.07	14.25	12	7/8-9	94
12	15.50	3.08	11.74	10.18	12.25	6.12	1.18	0.87	2.00	4.50	1.13	17.00	12	7/8-9	136
14	17.50	3.73	12.90	11.95	14.50	7.75	1.38	.39x.39	2.00	6.50	1.42	18.75	12	1-8	227
16	19.81	4.11	14.68	12.94	17.75	10.38	1.97	.47x.39	2.50	6.50	1.66	21.25	16	1-8	345

1. 1 in. x 25.4 = 1 mm.

2. 1 lb x 0.454 = 1 kg (net weight for valve only – no actuator).

Table 13: ANSI Class 300 Two-Way Valve Dimensions, in.¹

Valve Size, in.	A	B	C	D	E	F	G	H	J	K	L	Lug Bolting Data			Net Valve Weight lb
												BC, in.	No. of Holes	Threads UNC-2B	
2-1/2	4.75	1.88	2.28	3.81	6.38	4.36	0.63	0.43	1.25	2.50	0.77	5.88	8	3/4-10	15
3	5.25	1.88	2.28	4.09	6.63	4.36	0.63	0.43	1.25	2.50	0.77	6.63	8	3/4-10	17
4	6.75	2.03	3.72	4.71	7.50	4.36	0.63	0.43	1.25	2.50	0.75	7.88	8	3/4-10	23
5	8.25	2.23	4.80	5.13	8.00	5.12	0.75	0.51	1.25	4.50	0.94	9.25	8	3/4-10	39
6	8.88	2.42	5.75	6.25	8.75	5.12	0.87	0.63	1.25	4.50	0.97	10.62	12	3/4-10	54
8	10.94	2.82	7.56	7.55	10.00	6.12	1.18	0.87	2.00	4.50	1.10	13.00	12	7/8-9	89
10	13.26	3.28	9.44	9.36	11.38	6.12	1.38	.39x.39	2.00	4.50	1.28	15.25	16	1-8	144
12	15.57	3.62	11.31	10.89	13.50	7.75	1.38	.39x.39	2.00	6.50	1.40	17.75	16	1-1/8-8	217
14	17.90	4.66	11.38	12.50	18.25	10.38	1.97	.47x.39	2.50	6.50	2.13	20.25	20	1-1/8-8	444

1. 1 in. x 25.4 = 1 mm.

2. 1 lb x 0.454 = 1 kg (net weight for valve only – no actuator).

Table 14: Two-Way ANSI Class 150 VF Series High-Pressure, High-Temperature Butterfly Valve Actuator Mounting and Valve Lug Bolting¹ Dimensions

Valve Size, in.	Actuator Mounting			Valve Lug Bolting		
	Bolt Pattern, in. (mm)	Number of Holes ²	Hole Diameter, in. (mm)	Bolt Circle, in. (mm)	Number of Holes ³	Bolt Thread UNC-2B
2-1/2	2-3/4 (70)	4	3/8 (10)	5-1/2 (140)	4	5/8-11
3	2-3/4 (70)	4	3/8 (10)	6 (152)	4	5/8-11
4	2-3/4 (70)	4	3/8 (10)	7-1/2 (191)	8	5/8-11
5	2-3/4 (70)	4	3/8 (10)	8-1/2 (216)	8	3/4-10
6	2-3/4 (70)	4	3/8 (10)	9-1/2 (241)	8	3/4-10
8	4-29/32 (125)	4	9/16 (14)	11-3/4 (298)	8	3/4-10
10	4-29/32 (125)	4	9/16 (14)	14-1/4 (362)	12	7/8-9
12	4-29/32 (125)	4	9/16 (14)	17 (432)	12	7/8-9
14	6-1/2 (165)	4	13/16 (21)	18-3/4 (476)	12	1-8
16	6-1/2 (165)	4	13/16 (21)	21-1/4 (540)	16	1-8

1. See Table 12 and Table 13 for bolting requirements.

2. Actuator mounting holes are drilled (not tapped).

3. Lug holes are drilled and tapped, and evenly spaced around the valve.

Table 15: Two-Way ANSI Class 300 VF Series High-Pressure, High-Temperature Butterfly Valve Actuator Mounting and Valve Lug Bolting¹ Dimensions

Valve Size, in.	Actuator Mounting			Valve Lug Bolting		
	Bolt Pattern, in. (mm)	Number of Holes ²	Hole Diameter, in. (mm)	Bolt Circle, in. (mm)	Number of Holes ³	Bolt Thread UNC-2B
2-1/2	2-3/4 (70)	4	3/8 (10)	5-7/8 (149)	8	3/4-10
3	2-3/4 (70)	4	3/8 (10)	6-5/8 (168)	8	3/4-10
4	2-3/4 (70)	4	3/8 (10)	7-7/8 (200)	8	3/4-10
5	2-3/4 (70)	4	3/8 (10)	9-1/4 (235)	8	3/4-10
6	4-29/32 (125)	4	9/16 (14)	10-5/8 (270)	12	3/4-10
8	4-29/32 (125)	4	9/16 (14)	13 (330)	12	7/8-9
10	4-29/32 (125)	4	9/16 (14)	15-1/4 (387)	16	1-8
12	4-29/32 (125)	4	9/16 (14)	17-3/4 (451)	16	1-1/8-8
14	6-1/2 (165)	4	13/16 (21)	20-1/4 (514)	20	1-1/8-8

1. See Table 12 and Table 13 for bolting requirements.
2. Actuator mounting holes are drilled only (not tapped).
3. Lug holes are drilled and tapped, and evenly spaced around the valve.

Table 16: Flange Screws Required for VF Series High-Pressure, High-Temperature Butterfly Valves

Valve Size, in.	Regular Hex-Head Screws with National Course Threads					
	ANSI Class 150 Valves			ANSI Class 300 Valves		
	Diameter, in. (mm)	Length ¹ , in. (mm)	Number Required	Diameter, in. (mm)	Length ¹ , in. (mm)	Number Required
2-1/2	5/8 (16)	1-1/2 (38)	4	3/4 (19)	1-3/4 (44)	8
	5/8 (16)	2 (51) ²	4	3/4 (19)	2-1/4 (57) ²	8
3	5/8 (16)	1-1/2 (38)	4	3/4 (19)	1-3/4 (44)	8
	5/8 (16)	2 (51) ²	4	3/4 (19)	2-1/4 (57) ²	8
4	5/8 (16)	1-3/4 (44)	8	3/4 (19)	2 (51)	8
	5/8 (16)	2-1/4 (57) ²	8	3/4 (19)	2-1/2 (64) ²	8
5	3/4 (19)	1-3/4 (44)	8	3/4 (19)	2-1/2 (64)	12
	3/4 (19)	2-1/4 (57) ²	8	3/4 (19)	3-1/4 (82) ²	12
6	3/4 (19)	1-3/4 (44)	8	3/4 (19)	2-1/4 (57)	12
	3/4 (19)	2-1/4 (57) ²	8	3/4 (19)	3 (76) ²	12
8	3/4 (19)	2 (51)	8	7/8 (22)	3 (76)	12
	3/4 (19)	2-1/2 (64) ²	8	7/8 (22)	3-1/2 (88) ²	12
10	7/8 (22)	2 (51)	12	1 (25)	3-1/2 (88)	16
	7/8 (22)	3 (76) ²	12	1 (25)	3-1/2 (88) ²	16
12	7/8 (22)	2 (51)	12	1-1/8 (29)	3-1/2 (88)	16
	7/8 (22)	3 (76) ²	12	1-1/8 (29)	4 (102) ²	16
14				1-1/8 (29)	4 (102)	16
	1 (25)	2-1/2 (64)	12	1-1/8 (29)	4 (102) ²	16
	1 (25)	3-1/2 (88) ²	12	1-1/8 (29)	3 (76)	4 ³
				1-1/8 (29)	3-1/2 (88) ²	4 ³
16	1 (25)	3 (76)	16	---	---	---
	1 (25)	3-1/2 (88) ²	16			

1. Bolt lengths indicated include allowances for installing 1/16 or 1/8 in. thick gasket. Refer to the flange standards for bolting material specifications (as listed in ANSI B16.5 and American Society of Mechanical Engineers [ASME] B16.47).
2. Install from seat retainer side of valve.
3. Install in flange bolt holes closest to the valve stem.

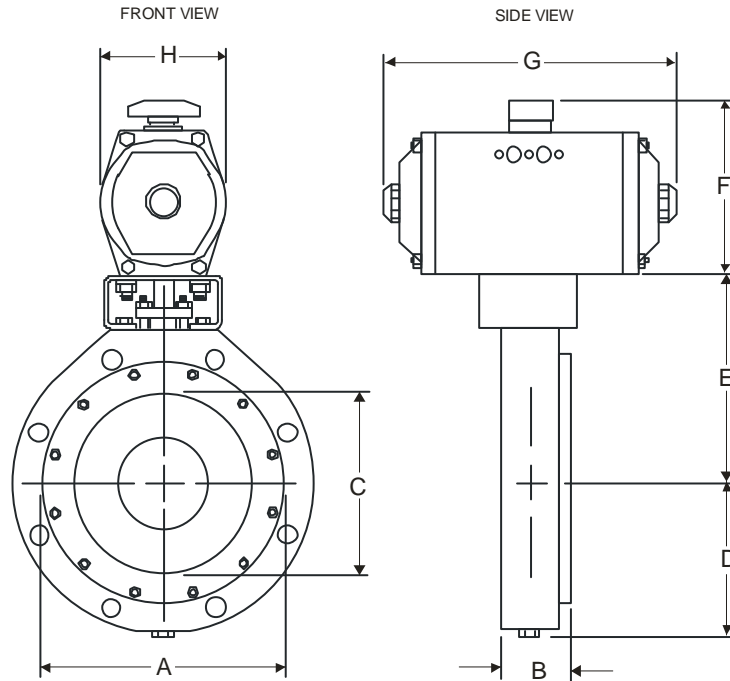


Figure 15: Overall Dimensions, in. (mm) for Industrial-Grade V-9000 Series High Pressure Pneumatic Actuated Two-Way VF Series High-Pressure, High-Temperature Butterfly Valves (See Table 17 and Table 18.)

Table 17: Overall Dimensions, in. (mm) for Industrial-Grade V-9000 Series High Pressure Pneumatic Actuated Two-Way VF Series High-Pressure, High-Temperature Butterfly Valves^{1,2}

Valve Size, in.	Dimensions, in. (mm)			
	B		E	
	ANSI Class 150 Valves	ANSI Class 300 Valves	ANSI Class 150 Valves	ANSI Class 300 Valves
2-1/2	1.88 (48)	1.88 (48)	6.38 (162)	6.38 (162)
3	1.88 (48)	1.88 (48)	6.63 (168)	6.63 (168)
4	2.03 (52)	2.03 (52)	7.50 (191)	7.50 (191)
5	2.23 (57)	2.23 (57)	7.50 (191)	8.01 (203)
6	2.23 (57)	2.42 (61)	8.00 (203)	8.75 (222)
8	2.40 (61)	2.82 (72)	9.50 (241)	10.00 (254)
10	2.75 (70)	3.28 (83)	10.75 (273)	11.38 (289)
12	3.08 (78)	3.62 (92)	12.25 (311)	13.50 (343)
14	3.73 (95)	4.66 (117)	14.50 (368)	18.25 (464)
16	4.11 (104)	---	17.75 (451)	---

1. The overall height requirements listed for V-9x92, V-9x93, V-9x94, and V-9x95 actuated VF Series High-Pressure, High-Temperature Butterfly Valves include 6-1/2 in. (165 mm) for a positioner; overall height requirements for V-9x96, V-9x97, and V-9x98 actuated assemblies include 7-1/2 in. (191 mm) for a positioner.
2. If a positioner is mounted on a travel switch, add 7 in. (178 mm) to the overall height requirement listed above.

Table 18: Overall Dimensions, in. (mm) for Industrial-Grade V-9000 Series High Pressure Pneumatic Actuated Two-Way VF Series High-Pressure, High-Temperature Butterfly Valves^{1, 2}

Actuator Sub-Code		Dimensions, in (mm)		
Spring Return	Non-Spring Return	F	G	H
-3x0	-030	5.43 (138)	7.40 (188)	4.07 (103)
-4x0	-040	5.78 (147)	8.59 (218)	4.44 (113)
-4x2	-042	7.28 (185)	11.90 (302)	5.15 (131)
-5x0	-050	8.09 (205)	12.31 (313)	5.58 (142)
-6x0	-060	9.36 (238)	15.54 (395)	7.17 (182)
-7x0	-070	11.62 (295)	19.57 (497)	8.97 (228)
-8x0	-080	13.49 (343)	28.78 (731)	10.79 (274)

1. The overall height requirements listed for V-9x92, V-9x93, V-9x94, and V-9x95 actuated VF Series High-Pressure, High-Temperature Butterfly Valves include 6-1/2 in. (165 mm) for a positioner; overall height requirements for V-9x96, V-9x97, and V-9x98 actuated assemblies include 7-1/2 in. (191 mm) for a positioner.
2. If a positioner is mounted on a travel switch, add 7 in. (178 mm) to the overall height requirement listed above.

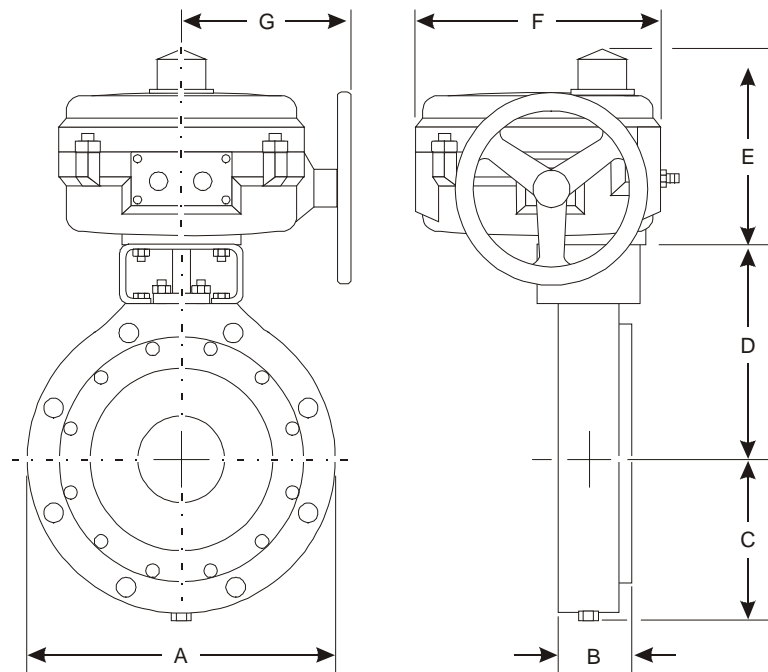


Figure 16: Overall Dimensions, in. (mm) for Industrial-Grade VA-9070 Series Electric Actuated Two-Way VF Series High-Pressure, High Temperature Butterfly Valves (See Table 19 and Table 20.)

Table 19: Overall Dimensions, in. (mm) for Industrial-Grade VA-9070 Series Electric Actuated Two-Way VF Series High-Pressure, High-Temperature Butterfly Valves^{1,2}

Valve Size, in.	Dimensions, in. (mm)			
	B		D	
	ANSI Class 150 Valves	ANSI Class 300 Valves	ANSI Class 150 Valves	ANSI Class 300 Valves
2-1/2	1.88 (48)	1.88 (48)	6.38 (162)	6.38 (162)
3	1.88 (48)	1.88 (48)	6.63 (168)	6.63 (168)
4	2.03 (52)	2.03 (52)	7.50 (191)	7.50 (191)
5	2.23 (57)	2.23 (57)	7.50 (191)	8.01 (203)
6	2.23 (57)	2.42 (61)	8.00 (203)	8.75 (222)
8	2.40 (61)	2.82 (72)	9.50 (241)	10.00 (254)
10	2.75 (70)	3.28 (83)	10.75 (273)	11.38 (289)
12	3.08 (78)	3.62 (92)	12.25 (311)	13.50 (343)

1. The overall height requirements listed for V-9x92, V-9x93, V-9x94, and V-9x95 actuated VF Series High-Pressure, High-Temperature Butterfly Valves include 6-1/2 in. (165 mm) for a positioner; overall height requirements for V-9x96, V-9x97, and V-9x98 actuated assemblies include 7-1/2 in. (191 mm) for a positioner.
2. If a positioner is mounted on a travel switch, add 7 in. (178 mm) to the overall height requirement listed above.

Table 20: Overall Dimensions, in. (mm) for Industrial-Grade VA-9070 Series Electric Actuated Two-Way VF Series High-Pressure, High-Temperature Butterfly Valves

Actuator Sub-Code		Dimensions, in. (mm)		
On/Off	Proportional	E ¹	F	G
-722	-702	6.70 (170)	7.50 (191)	5.60 (142)
-723	-703	8.10 (206)	10.10 (257)	7.80 (198)
-724	-704	8.10 (206)	10.10 (257)	7.80 (198)
-725	-705	8.10 (206)	10.10 (257)	7.80 (198)
-726	-706	8.80 (224)	12.10 (307)	9.50 (241)
-727	-707	8.80 (224)	12.10 (307)	9.50 (241)
-728	-708	8.80 (224)	12.10 (307)	9.50 (241)

1. Allow an additional 6 in. (152 mm) for actuator cover removal.

Table 21: Height Requirements, in. (mm) for Industrial-Grade VA-9000 Series Electric Actuated Two-Way VF Series High-Pressure, High-Temperature Butterfly Valves (above Centerline of Pipe; Includes 10 in. Head Clearance)

Valve Size, in.	VA-9000 Series Electric Actuator			
	VA-9007-01	VA-9007-02	VA-9008-01	VA-9008-02
14	40.48 (1,028)	40.48 (1,028)	43.43 (1,111)	43.43 (1,111)
16	---	---	43.43 (1,111)	43.43 (1,111)

Table 22: ANSI Class 150 Valve Flow Coefficients, Cv (kv)

Valve Size, in.	Disc Position (Degrees of Rotation) ¹								
	90°	80°	70°	60°	50°	40°	30°	20°	10°
2-1/2	160 (137)	136 (117)	100 (86)	78 (67)	50 (43)	30 (26)	16 (14)	8 (6.8)	3 (2.6)
3	185 (159)	178 (152)	155 (133)	123 (105)	87 (75)	56 (48)	32 (27)	14 (12)	4.8 (4.1)
4	375 (321)	365 (313)	315 (270)	250 (214)	175 (150)	115 (99)	63 (54)	31 (27)	10 (8.6)
5	790 (677)	675 (578)	500 (429)	360 (309)	238 (204)	146 (125)	78 (67)	41 (35)	16 (14)
6	1,350 (1,160)	1,070 (917)	750 (643)	510 (437)	330 (283)	218 (187)	140 (120)	81 (69)	35 (30)
8	2,800 (2,400)	2,230 (1,910)	1,590 (1,360)	1,060 (908)	685 (587)	456 (391)	280 (240)	165 (141)	65 (56)
10	4,300 (3,690)	3,450 (2,960)	2,430 (2,080)	1,630 (1,400)	1,050 (900)	700 (600)	450 (386)	250 (214)	100 (86)
12	6,650 (5,700)	5,330 (4,570)	3,750 (3,210)	2,530 (2,170)	1,630 (1,400)	1,080 (926)	700 (600)	390 (334)	155 (133)
14	7,650 (6,560)	6,100 (5,230)	4,300 (3,685)	2,900 (2,490)	1,890 (1,620)	1,250 (1,070)	810 (694)	450 (386)	175 (150)
16	9,800 (8,400)	7,860 (6,740)	5,510 (4,720)	3,700 (3,170)	2,420 (2,070)	1,530 (1,310)	1,020 (874)	580 (497)	230 (197)

1. Recommended disc rotation is between 30° and 70° open; preferred disc rotation for control valve sizing is 50° and 70° open.

Table 23: ANSI Class 300 Valve Flow Coefficients, Cv (kv)

Valve Size, in.	Disc Position (Degrees of Rotation) ¹								
	90°	80°	70°	60°	50°	40°	30°	20°	10°
2-1/2	160 (137)	136 (117)	100 (86)	78 (67)	50 (43)	30 (26)	16 (14)	8 (6.8)	3 (2.6)
3	185 (159)	178 (152)	155 (133)	123 (105)	87 (75)	56 (48)	32 (27)	14 (12)	4.8 (4.1)
4	375 (321)	365 (313)	315 (270)	250 (214)	175 (150)	115 (99)	63 (54)	31 (27)	10 (8.6)
5	790 (677)	675 (578)	500 (429)	360 (309)	238 (204)	146 (125)	78 (67)	41 (35)	16 (14)
6	1,000 (857)	875 (750)	710 (608)	530 (454)	370 (317)	240 (206)	138 (118)	79 (68)	26 (22)
8	2,000 (2,270)	1,720 (1,470)	1,360 (1,170)	950 (814)	630 (540)	405 (347)	240 (206)	121 (104)	47 (40)
10	2,650 (2,270)	2,250 (1,930)	1,740 (1,490)	1,200 (1,028)	780 (668)	510 (437)	295 (253)	150 (129)	61 (52)
12	4,000 (3,430)	3,400 (2,910)	2,500 (2,140)	1,690 (1,450)	1,100 (943)	710 (608)	430 (369)	220 (189)	92 (79)
14	4,100 (3,514)	3,500 (3,000)	2,600 (2,228)	1,770 (1,517)	1,200 (1,028)	830 (711)	490 (420)	240 (206)	100 (86)

1. Recommended disc rotation is between 30° and 70° open; preferred disc rotation for control valve sizing is 50° and 70° open.

Table 24: Expected Seating/Unseating Torque Values¹, lb-in (N-m) and Maximum Flow Rates², U.S.G.P.M. (Liters per Second)

Valve Size, in.	ANSI Class 150 Valves			ANSI Class 300 Valves		
	High-Pressure Valves ΔP Pressure, psig (kPa) 150 to 285 psig (1,034 to 1,964 kPa)			High-Pressure Valves ΔP Pressure, psig (kPa) 285 to 740 psig (1,965 to 5,102 kPa)		
	Torque ¹ Upstream	Torque Downstream	Maximum Flow ²	Torque ¹ Upstream	Torque Downstream	Maximum Flow ²
2-1/2	215 (24.3)	300 (33.9)	400 (25.2)	470 (53.1)	670 (75.7)	550 (34.7)
3	230 (26.0)	320 (36.2)	400 (25.2)	490 (55.4)	690 (78.0)	550 (34.7)
4	320 (36.2)	460 (52.0)	400 (25.2)	700 (79.1)	1,000 (113.0)	580 (36.5)
5	730 (82.5)	1,040 (118)	500 (31.5)	1,800 (203.4)	2,550 (288.1)	630 (39.7)
6	840 (95.0)	1,200 (136)	600 (37.8)	2,100 (237.3)	3,000 (339.0)	880 (55.5)
8	1570 (177.4)	2,100 (237)	1,000 (63.1)	3,700 (418.0)	5,300 (599.0)	1,060 (66.8)
10	2870 (324.3)	4,100 (463)	1,500 (94.6)	7,000 (790.9)	10,000 (1130.0)	2,100 (132)
12	4550 (514.1)	6,500 (734)	2,500 (157)	10,500 (1,186.3)	15,000 (1694.8)	3,400 (214)
14	6,650	9,500 (1,073)	3,400 (214)	15,400 (1,340.0)	22,000 (2485.7)	3,800 (239)
16	10,500	15,000 (1,695)	5,200 (328)	---	---	---

1. Includes a safety factor (valve installed with the seat retainer oriented upstream).
2. Maximum flow rates of water in U.S.G.P.M. (liters per second). The values listed are the maximum flow rates in U.S.G.P.M. before dynamic torques must be considered to determine which torque is greater (seating/unseating or dynamic). Water equivalent is used; for other fluids, divide the given flow rates by the square root of SG, where SG = Specific Gravity. For water, SG = 1.

Note: For fluids with solids or abrasive content, the torque may be increased; consult the local Johnson Controls office for increased torque values.

Table 25: Mounting Kits¹ for Field Mounting Industrial-Grade V-9000 Series High Pressure Pneumatic Actuators to Two-Way ANSI Class 150 VF Series High-Pressure, High-Temperature Butterfly Valves

Valve Size, in.	Industrial-Grade V-9000 Series High Pressure Pneumatic Actuator						
	V-9x93	V-9x94-1	V-9x94-2	V-9x95	V-9x96	V-9x97	V-9x98
2-1/2	V-9094-410	V-9094-410	V-9095-410	V-9095-410	---	---	---
3	V-9094-410	V-9094-410	V-9095-410	V-9095-410	---	---	---
4	V-9094-410	V-9094-410	V-9095-410	V-9095-410	---	---	---
5	---	---	V-9095-610	V-9095-610	V-9096-610	---	---
6	---	---	V-9095-610	V-9095-610	V-9096-610	---	---
8	---	---	---	V-9095-810	V-9096-810	V-9097-810	---
10	---	---	---	---	---	V-9097-1210	---
12	---	---	---	---	---	V-9097-1210	---
14	---	---	---	---	---	V-9097-1610	V-9098-1610
16	---	---	---	---	---	---	V-9098-1610

1. Mounting kit contains a bracket, adaptor, and mounting hardware.

Table 26: Mounting Kits¹ for Field Mounting Industrial-Grade VA-907x Series Electric Actuators to Two-Way ANSI Class 150 VF Series High-Pressure, High-Temperature Butterfly Valves

Valve Size, in.	Industrial-Grade VA-907x Series Electric Actuator						
	VA-9072	VA-9073	VA-9074	VA-9075	VA-9076	VA-9077	VA-9078
2-1/2	VA-9072-410	---	---	---	---	---	---
3	VA-9072-410	---	---	---	---	---	---
4	VA-9072-410	---	---	---	---	---	---
5	---	---	VA-9075-610	---	---	---	---
6	---	---	---	VA-9075-610	---	---	---
8	---	---	---	---	VA-9078-810	---	---
10	---	---	---	---	---	VA-9078-1210	---
12	---	---	---	---	---	---	VA-9078-1210

1. Mounting kit contains a bracket, adaptor, and mounting hardware.

Table 27: Mounting Kits¹ for Field Mounting Industrial-Grade VA-900x Series Electric Actuators to Two-Way ANSI Class 150 VF Series High-Pressure, High-Temperature Butterfly Valves

Valve Size, in.	Industrial-Grade VA-900x Series Electric Actuator	
	VA-9007	VA-9008
14	VA-9007-1410	---
16	---	VA-9008-1610

1. Mounting kit contains a bracket, adaptor, and mounting hardware.

Table 28: Mounting Kits¹ for Field Mounting Industrial-Grade V-9000 Series High Pressure Pneumatic Actuators to Two-Way ANSI Class 300 VF Series High-Pressure, High-Temperature Butterfly Valves

Valve Size, in.	Industrial-Grade V-9000 Series High Pressure Pneumatic Actuator						
	V-9x93	V-9x94-1	V-9x94-2	V-9x95	V-9x96	V-9x97	V-9x98
2-1/2	V-9094-430	V-9094-430	V-9095-430	---	---	---	---
3	V-9094-430	V-9094-430	V-9095-430	---	---	---	---
4	---	---	V-9095-430	V-9095-430	---	---	---
5	---	---	V-9095-530	V-9095-530	V-9096-530	V-9097-530	---
6	---	---	---	V-9095-630	V-9096-630	V-9097-630	---
8	---	---	---	---	V-9096-830	V-9097-830	V-9098-830
10	---	---	---	---	---	V-9097-1230	V-9098-1230
12	---	---	---	---	---	V-9097-1230	V-9098-1230
14	---	---	---	---	---	---	V-9098-1430

1. Mounting kit contains a bracket, adaptor, and mounting hardware.

Table 29: Mounting Kits¹ for Field Mounting Industrial-Grade VA-907x Series Electric Actuators to Two-Way ANSI Class 300 VF Series High-Pressure, High-Temperature Butterfly Valves

Valve Size, in.	Industrial-Grade VA-907x Series Electric Actuator						
	VA-9072	VA-9073	VA-9074	VA-9075	VA-9076	VA-9077	VA-9078
2-1/2	---	VA-9075-430	---	---	---	---	---
3	---	VA-9075-430	---	---	---	---	---
4	---	VA-9075-430	---	---	---	---	---
5	---	---	---	VA-9075-530	---	---	---
6	---	---	---	---	VA-9078-630	---	---
8	---	---	---	---	---	VA-9078-830	---
10	---	---	---	---	---	---	---
12	---	---	---	---	---	---	---

1. Mounting kit contains a bracket, adaptor, and mounting hardware.

Table 30: Mounting Kits¹ for Field Mounting Industrial-Grade VA-900x Series Electric Actuators to Two-Way ANSI Class 300 VF Series High-Pressure, High-Temperature Butterfly Valves

Valve Size, in.	Industrial-Grade VA-900x Series Electric Actuator	
	VA-9007	VA-9008
10	VA-9007-1230	---
12	---	VA-9008-1230
14	---	VA-9008-1430

1. Mounting kit contains a bracket, adaptor, and mounting hardware.

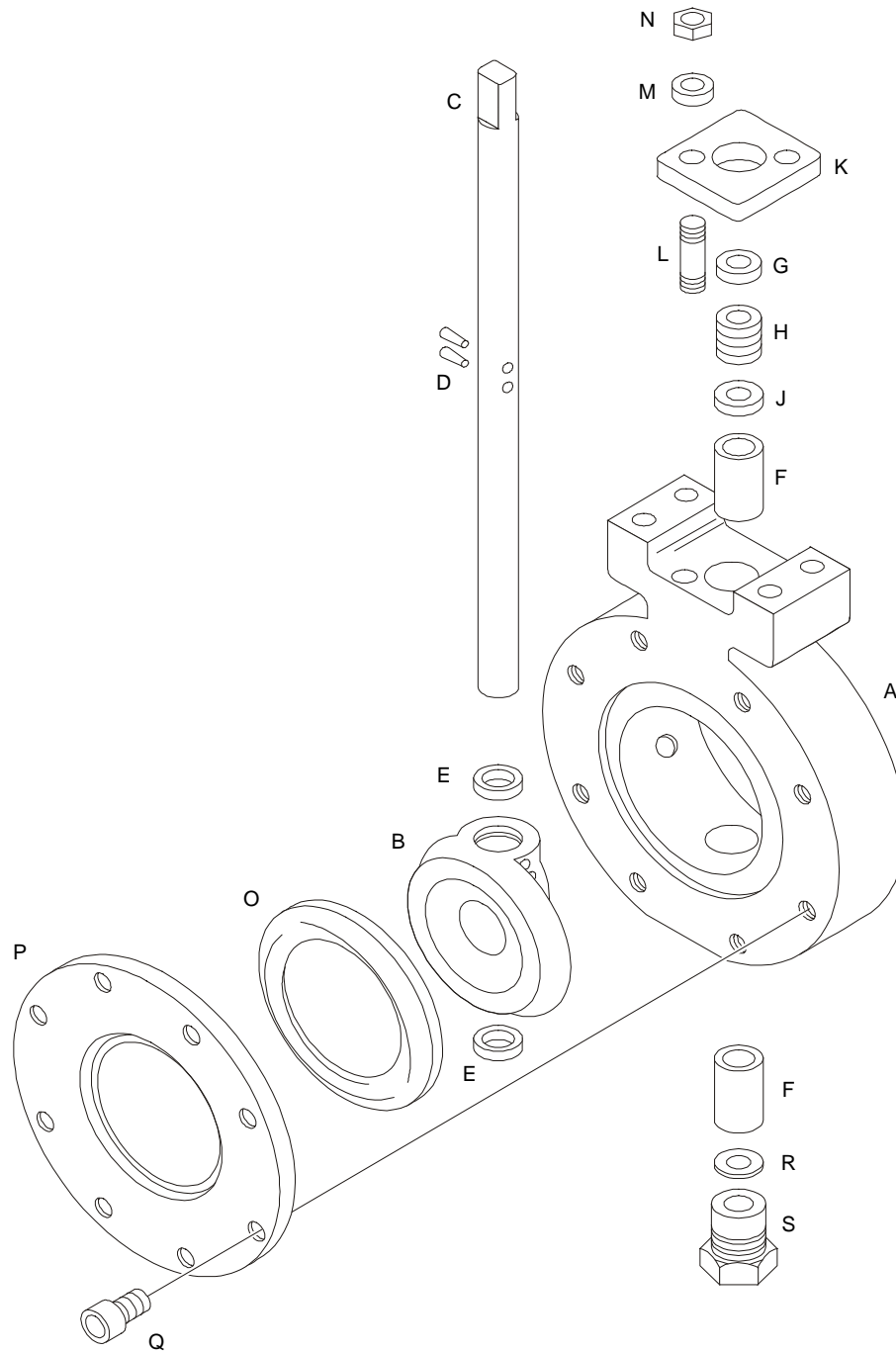


Figure 17: VF Series High-Pressure, High-Temperature Butterfly Valve Materials of Construction (See Table 31.)

Table 31: Materials of Construction

Valve Part	Description	Materials of Construction
A	Body	Carbon Steel, ASTM A216 GR WCB/A516 GR 70
B	Disc	Stainless Steel, ASTM A 351 GR CF8M
C	Stem	17-4 PH Stainless Steel, ASTM A564-Type 630
D	Taper Pin (Two Locations)	17-4 PH Stainless Steel, ASTM A564-Type 630 ¹ 316 Stainless Steel ² , ASTM 276 Type 316
E	Disc Spacer ³ (Two Locations)	316 Stainless Steel, ASTM 276 Type 316
F	Bearing Assembly (Two Locations)	316 Stainless Steel with TFE and Glass Fiber Liner
G	Gland Ring	216 Stainless Steel, ASTM 276 Type 316
H	Stem Seal	One Carbon Fiber Ring and Three TFE Rings
J	Thrust Washer	316 Stainless Steel, ASTM 276 Type 316
K	Gland Retainer	Carbon Steel, ASTM A216 GR WCB/A516 GR 70
L	Stud ⁴ (Two Locations)	316 Stainless Steel, ASTM A193-B8M
M	Lock Washer ⁴ (Two Locations)	18-8 Stainless Steel
N	Hex Nut ⁴ (Two Locations)	18-8 Stainless Steel
O	Seat Assembly	RTFE ⁵ with Silicone Rubber O-Ring
P	Seat Retainer	Carbon Steel, ASTM A516 GR 70
Q	Cap Screw (Eight Locations)	Alloy Steel
R	O-Ring Gasket	PTFE
S	Locating Plug ⁶	Carbon Steel, Phosphate Coated
Not Shown	Bellville Washer and Grounding Washer	18-8 Stainless Steel (For 14 and 16 in. ANSI Class 150 Valves and 14 in. ANSI Class 300 Valves)

1. 2-1/2 through 12 in. ANSI Class 150, and ANSI Class 300 valves.
2. 14 and 16 in. ANSI Class 150, and 14 in. ANSI Class 300 valves.
3. Four for 8 in. and larger valves.
4. Four for 14 and 16 in. valves.
5. RTFE is supplied by Johnson Controls as RPTFE (reinforced polytetrafluoroethylene).
6. Not applicable for 2-1/2 through 5 in ANSI Class 150 valves (applicable only for 6 through 12 in. ANSI Class 300 valves).

Technical Specifications

Table 32: Technical Specifications¹

Product		VF Series High-Pressure, High-Temperature Butterfly Valves
Service		Hot Water, Chilled Water, Condenser Water, and Steam ²
Models and Ordering Data		See Table 1 through Table 6.
Body Styles and Sizes		Two-Way, 2-1/2 through 16 in., Fully Lugged ³
Fluid Temperature Limits		-20 to 500°F (-29 to 260°C)
Maximum Closeoff Pressure (See Table 3 through Table 6.)	2-1/2 through 16 in. ANSI Class 150 Valves (Type V)	240 psig (1,654 kPa) at 250°F (121°C) Fluid Temperature, Bidirectional ³ 240 psig (1,654 kPa) at 250°F (121°C) Fluid Temperature, Dead-End Service ^{3, 4}
	2-1/2 through 14 in. ANSI Class 300 Valves (Type Z)	550 psig (3,790 kPa) at 250°F (121°C) Fluid Temperature, Bidirectional; ^{3, 5} 550 psig (3,790 kPa) at 250°F (121°C) Fluid Temperature, Dead-End Service ^{3, 4, 5}
Maximum Flow Rate		See Table 24. ⁶
Flow Coefficients (Cv)	ANSI Class 150 Valves	See Table 22.
	ANSI Class 300 Valves	See Table 23.
Torque Requirements	ANSI Class 150 Valves	See Table 24. ⁶
	ANSI Class 300 Valves	See Table 24. ⁶
Materials		See Table 31.
Ambient Storage Temperature Limits		-20 to 150°F (-29 to 66°C); Preferably 40 to 85°F (4 to 29°C)
Accessories (Order Separately)		Ten-Position Manual Handles (See Table 10.)
		Gear-Operated Manual Hand Wheels (See Table 11.)
Representative Maximum Valve and Actuator Assembly Shipping Weights	ANSI Class 150 Valves	See Table 8.
	ANSI Class 300 Valves	See Table 9.

1. Refer to the appropriate actuator product bulletin for actuator specifications.
2. Type **V** and **Z** valves are rated for 150 psig (1,034 kPa) saturated steam at 366°F (186°C) for two-position applications, and 50 psig (345 kPa) saturated steam at 297°F (147°C) for modulating applications. Refer to *VF Series High-Pressure, High-Temperature Butterfly Valves for Steam Service Application Note (LIT-977321)* for more information.
3. For 18 in. or larger ANSI Class 150 valves and 16 in. or larger ANSI Class 300 valves, consult the local Johnson Controls office.
4. The preferred orientation of the seat retainer in dead-end service is against the flange.
5. For pressures between 550 and 740 psig (3,790 and 5,099 kPa), consult the local Johnson Controls office.
6. Published valve torque requirements are based on flow conditions that do not exceed the maximum flow rates found in Table 24.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.



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